be compared, the two stages, which can be most readily determined to be correspondent, being the first and the last. This, together with the greater amount of differentiation found in the adult stage, leads him to the conclusion that end stages in the ontogeny are more important for purposes of comparison, than any other stages. The rigid application of this principle leads him to some very unusual conclusions; *e. g.*, most zoologists will be astonished at the statement that *Sacculina* is not a Crustacean, because in its adult condition it has lost the Crustacean characters which it possessed as a larva. Similarly the statement that the group Chordata is inadmissible because tunicates, Amphioxus and vertebrates are very unlike in the adult condition, though their larvæ show fundamental resemblances, seems to the writer to be out of harmony with the broad and liberal method of comparison advocated in the closing section of the chapter, viz., 'to neglect nothing, to consider every property, kind of individual, every embryonic stage,' etc.

The chapter on the 'Relative Values of Morphological Characters' deals with many interesting questions. The author concludes that types of symmetry—radial, spiral, bilateral—are of little phylogenetic significance, but that metameric segmentation is of great importance. An excellent review of the theories as to the origin of metamerism is followed by the author's view that metamerism has arisen, not from asexual reproduction, but from division of organs, 'Just as one cell gives rise to others by division, so one organ produces others by division.'

In general the conclusion is drawn that the most important of all morphological characters for the purpose of comparison are those which relate to the relative position and connection of parts.

In the tenth chapter the 'Criteria of Racial Advancement' are discussed. Whether an organism is to be regarded as 'high' or 'low,' is, according to the author, dependent entirely upon the length of its line of descent, irrespective of its final complexity or simplicity. This again leads to some very unusual conclusions and causes one to doubt the value of any such definition.

Limits of space have made it necessary to consider only a few of the subjects treated in this work, and the author's conclusions have been stated without presenting the cogent, if not always convincing, arguments by which these conclusions are reached, nevertheless this review will serve to show the great extent and importance of the subjects treated. The author's intimate acquaintance with the great wealth of phenomena and with the extensive literature dealt with in this book, makes it one of particular importance and value to biological students.

E. G. Conklin.

SCIENTIFIC JOURNALS AND ARTICLES.

The Journal of Comparative Neurology and Psychology for July contains the following articles: Dr. G. E. Coghill describes the 'Cranial Nerves of *Triton tæniatus*,' comparing the microscopic anatomy and nerve components with *Amblystoma* and the forms described by Drüner. 'Retrograde Degeneraton in the Spinal Nerves,' by S. Walter Ranson. An experimental study of the atrophic changes in both spinal nerves and the cells of the spinal ganglia and spinal cord with special reference to the differences between the typical Wallerian and the retrograde degeneration. 'The Primitive Pores of *Polydon spathula*,' by Herbert D. Kistler, describes with a plate the peculiar sense organs on the bill of the spoon-bill catfish. 'The Reactions of Crayfish to Chemical Stimuli,' by James Carleton Bell. A careful examination of the whole body surface to discover its sensitiveness to various types of chemical solutions. An editorial on abnormal psychology and book notices complete the number.

The *Botanical Gazette* for July contains the following papers: E. C. Jeffrey and M. A. Chrysler discuss the Cretaceous *Pityoxyla*, describing two new species, one from the Middle Cretaceous of Staten Island, the other from Massachusetts. Certain differences from modern pines are pointed out and regarded as ancestral. H. L. Shantz publishes a result of his study of the vegetation of the Mesa region

east of Pikes Peak, discussing the Bouteloua formation as to its structure. Aven Nelson publishes 15 new species of seed plants from the Rocky Mountain region. George J. Peirce gives an account of *Anthoceros* and its Nostoc colonies, showing the fallacy of Prantl's argument that because cavities and hairs do not develop in the usual way except where the colonies are, the liverwort must profit by such an association.

DISCUSSION AND CORRESPONDENCE.

GLACIATION IN THE SONORAN PROVINCE.

TO THE EDITOR OF SCIENCE: In the current number of SCIENCE[1] Dr. Frederick J. H. Merrill directs attention to moraine-like accumulations of debris observed by him at a number of localities in northern Sonora and southern Arizona and New Mexico; of which accumulations part are well known to me—though my provisional interpretations differed from those of Dr. Merrill. The district is too extensive and too little known to warrant broad generalizations or to justify negation of the suggestions offered by so acute an observer as Dr. Merrill; yet future observers may be aided by the alternative suggestions growing out of my own observations in half a dozen journeys in the saddle (with others by rail and stage) through the Sonoran province.

So far as my observations go, the more extensive debris accumulations of the type described by Dr. Merrill (including those in the borrow-pit near Nogales and thence southward to Imuris) are confined to districts of late Mesozoic or Cenozoic vulcanism; while in some cases the accumulations appear to pass both horizontally and vertically upward into undoubted volcanics, much as the tuff beds underlying each table mountain in California grade into more firmly lithified lava sheets. Concordantly, my interpretation of the debris accumulations was that they were originally, and sometimes are now, volcanic tuffs and breccias much like those found further northward along the Pacific coast save that the brecciated structure is more striking than I have seen elsewhere. Frequently the breccias and lava sheets overlie massive blue limestones undoubtedly equivalent to the vast Mesozoic (Cretaceous and Jurassic) limestone series of northeastern Mexico, and probably equivalent to the shale-mixed limestones of the Sierras, especially in southern California; and within a few miles of the borrow-pit south of Nogales (by which I once had occasion to camp for three days while awaiting official documents from Mexico) there are considerable exposures of this limestone, weathered as usual into the peculiar rugose surface—miniature mountain ranges and valleys—found by Hill and others to be characteristic of the Mesozoic limestones in the eastern Sierra Madre. The calcareous deposits are seen in places to rest (and probably everywhere lie) unconformably on granites, which in western Sonora and southwestern Arizona are of wide extent; yet neither on the limestone nor on the granitic terranes have I observed such debris accumulations as those so characteristic of the Imuris or Opodepe valley. Certain of the accumulations in this valley seemed to me well worthy of critical study as breccias primarily volcanic though accumulated in part by concurrent aqueous agencies, and recording in themselves a peculiarly complex volcanic history; for in several sections there are imbedded in the clay-like matrix angular boulders yards in dimensions, sometimes containing included boulder-like masses feet across, themselves made up of brecciated constituents inches or less in diameter. A part of the heterogeneous accumulations both in Imuris Valley and elsewhere were interpreted by me as rearranged breccias transported to limited distances and redeposited by sheetfloods or other freshets during the rather remote periods in which the lava sheets and tuff beds were newly exposed to surface erosion. In this connection it is to be noted that the province in question is the type region for sheetflooding, and that both the lower slopes of the sierras and the intervening plains are shaped by this agency; and also that sheetflood deposits are normally heterogeneous and ill-assorted accumulations of coarse and fine material, seldom perceptibly stratified or graded from coarse to fine either horizontally or vertically in the single section.

[1] Volume XXIV., pp. 116–118.